



Data from the Long Duration Exposure Facility is confirming notions about the space environment. Story on Page 3.



Two JSC workers are so wrapped up in their work, they decided to be married at Rocket Park. Story on Page 4.

Space News Roundup

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No. 29

Thompson says ball in NASA's court

Several of the most influential players in America's space program told a black-tie audience at the Spaceweek National Banquet on Monday that this summer's debate over funding for Space Station Freedom was not the last challenge to human exploration.

NASA Deputy Administrator J. R. Thompson, Rep. Jack Brooks and JSC Director Aaron Cohen agreed that other needs and programs will always vie for the space program's piece of the budget pie. NASA, they said, must execute its programs well and innovate if investments in the future are to continue.

The Spaceweek banquet was the highlight of the annual international extravaganza that remembers the 1969 Apollo 11 lunar landing mission and recognizes ongoing achievements in space exploration. Dennis Stone, volunteer president of Spaceweek National Headquarters in Houston, said 750,000 people in 150

cities attended Spaceweek events, and media coverage of those events reached "hundreds of millions."

Gov. Ann Richards sent a proclamation to Stone declaring July 16-24 to be Spaceweek throughout the State of Texas.

"It's been a long, hot summer for the space station," said Thompson, the keynote speaker. "There was a lot of debate. I listened to every word of it. I didn't hear anything against space. I didn't hear anybody against the space station. But it was about money; where it's coming from and the priorities of this country."

Thompson pointed out that the space station budget, killed by the House Appropriations Committee, was resurrected by a 3-1 margin in the House and affirmed by a 2-1 margin in the Senate.

"The basic commitment's made, but I also believe that

Please see **BROOKS**, Page 4



JSC Photo by Jack Jacob

NASA Deputy Administrator J.R. Thompson and Rep. Jack Brooks, D-Texas, kid around Monday night at the Spaceweek National Banquet.

Total Quality team to review JSC's progress

By Kelly Humphries

An agencywide team will visit JSC Aug. 5-6 to review the center's Total Quality Management program as part of an annual review at all NASA centers.

The site visit will occur just a week after the third senior management staff retreat to discuss JSC's strategic planning and Total Quality efforts. At the retreat Monday and Tuesday, top center managers will review the future of human space exploration and identify those roles and responsibilities the center wants to undertake.

Members of the site-visit team, who represent all NASA installations, will conduct a structured evaluation of JSC's progress toward implementing Total Quality.

The process began earlier this year when each center submitted a self-assessment to Headquarters. The self-assessments are being used by the team as a basis for determining program strengths and weaknesses and suggesting specific areas to review in detail during the site visits.

The site visit team will examine JSC's actions in eight areas: management leadership and support, strategic planning, focus on the customer, employee training and recognition, employee empowerment and teamwork, measurement and analysis, process optimization, and quality and productivity results.

The annual Total Quality review
Please see **TOTAL**, Page 4



NASA Photo

The STS-43 crew will have to wait a bit longer for a launch aboard *Atlantis*. From left are Pilot Mike Baker, Mission Specialists Shannon Lucid and Jim Adamson, Commander John Blaha and Mission Specialist David Low.

Engine controller glitch postpones *Atlantis*' launch

By James Hartsfield

Atlantis' launch on shuttle mission STS-43 was delayed early Wednesday when a main engine controller for the spacecraft malfunctioned while the orbiter was being fueled.

The controller is being replaced and the launch will likely be rescheduled for late next week, Kennedy Space Center's Launch Director Bob Sieck said.

"We have a previous experience base in changing out the controller in the vertical and the timeline we've laid out for that activity has the controller coming out this weekend, and the new one going in and being retested by early next week," Sieck said.

The controller, for the position 3 main engine aboard *Atlantis*, is essentially a computer that coordinates the functions of the engine.

Each main engine's controller has dual circuitry. The backup unit operated well on *Atlantis*, but flight rules prohibit launching without both units functioning well. The failure in channel A of the position 3 engine controller occurred about six hours prior to STS-43's planned launch, as the controller was performing a self-check routine. The controllers run a self check every 20 milliseconds during

that period of the launch countdown.

"We do checks on the controller at all stages of preparation, including prior to its installation," explained Jerry Smelser, manager of the Main Engine Project at the Marshall Space Flight Center. "Also, there are numerous checks in the pre-launch sequence. But frankly, we can't predict or anticipate the kind of problem we've had. And you can't guess why it happened when it happened."



The controller weighs more than 100 pounds and will be removed from *Atlantis* using a manual hoist.

The crew — Commander John Blaha, Pilot Mike Baker and Mission Specialists Shannon Lucid, Jim Adamson and David Low — flew back to JSC on Wednesday. They will continue to update their

training at JSC until a new launch target is set.

Elsewhere at KSC, *Discovery* was scheduled to move to the Vehicle Assembly Bldg. on Thursday to be linked to the solid rockets and external fuel tank for STS-48. *Discovery* is expected to move to the launch pad about Aug. 12 as it is readied to boost the Upper Atmospheric Research Satellite into orbit about Sept. 12.

Construction signals growth at JSC

Work beginning on Bldg. 4 South, ending on others

By Kyle Herring

Construction projects this summer signal continued growth at JSC as work on a new office building begins and ownership of two other buildings is transferred to the government.

Construction began late last month on the new six-story Bldg. 4 South, between Bldg. 4 and the cafeteria.

The new office building will contain 240,000 square feet of floor space and be linked to Bldg. 4 by a three-story passageway.

The Mission Operations Directorate will occupy the first three floors, and Flight Crew Operations will occupy the top two floors, said Don Holick, project architect in Center Operations' Facilities Development Division.

Other organizations are under consideration for occupying the remaining space in the new building.

"The addition of this building provides the center with the opportunity to minimize the off-site lease space and reduce overall housing costs to the agency," said Grady McCright, deputy director of Center Operations.

The new building, scheduled for completion in October 1992, will "employ some techniques in building that will help reduce the initial construction costs and also the long-range operating costs," Holick said.

"We found materials that are high-quality granites and marbles that can be bought very reasonably in today's market," he said, adding

that "many systems in this building will be prototypes for future buildings."

McCright agreed, saying this design will "take advantage of some of the emerging technologies of energy conservation" such as the new air conditioning system.

Center Operations Director Ken Gilbreath said the new facility, which also will house some limited computer and training equipment, "will set a new standard for building construction here at JSC. We are using this building to showcase many new materials and technologies available in the marketplace and will validate their potential use for future projects."

This fall, work will begin on a new security badging office near the
Please see **BADGING**, Page 4



JSC Photo by Jack Jacob

Flight Crew Operations Director Don Puddy, JSC's Bldg. 4 South Project Architect Don Holick and MOD Training Division Chief John Wegener visit the site of the six-story office building.

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m.-2 p.m. weekdays.

- General Cinema (valid for one year): \$4.
- AMC Theater (valid until May 1992): \$3.75.
- Loews Theater (valid for one year): \$4.
- AstroWorld (valid 1991 season): season, \$44.94; child less than 4-feet, \$10.12; one day, \$15.85; WaterWorld, \$8.15.
- SeaWorld of Texas (valid 1991 season): child (3-11), \$12.25; adults, \$17.25.
- Six Flags (valid until Nov. 17, 1991): one-day, \$15.95; child less than 4-feet, \$14.95; two-day, \$20.95.
- NASA Ski Week (Jan. 4-11, 1992, Big Sky Montana Resort; includes airfare, shuttle transfers, 6 day lift pass, 7 nights lodging): \$100 deposit due by Aug. 15; 2/Rm. -\$744/person; 3/Rm. -\$685/person; 4/Rm. -\$656/person.
- Ringling Bros. and Barnum and Baily Circus (noon Aug. 3 at the Summit): \$8.50.

JSC

Gilruth Center News

Sign up policy—All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a badge or EAA membership card. Classes tend to fill up four weeks in advance. For more information, call x30304.

Defensive driving—Course is offered from 8 a.m.-5 p.m., Oct. 12 or Nov. 6. Cost is \$15.

Aerobic dance—High/low-impact classes meet from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$24.

Exercise class—Low-impact class meets from 5:15-6:15 p.m. Monday and Wednesday nights. Cost is \$24.

Weight safety—Required course for employees wishing to use the Gilruth weight room. The next class will be from 8-9:30 p.m. Aug. 7 and Aug. 22. Cost is \$5.

Aikido—Martial arts class meets Tuesdays for six weeks beginning Aug. 6. Cost is \$30 per person.

Ballroom dancing—Beginning class will meet from 7-8:15 p.m. Thursdays, starting Aug. 1; beginning/intermediate class meets from 8:15-9:30 p.m. Thursdays beginning Aug. 1. Cost of eight-week course is \$60 per couple.

Tennis—Beginning tennis class meets Mondays for six weeks starting Aug. 12. Advanced beginners class meets Wednesdays beginning Aug. 14. Cost is \$32.

JSC

Technical Library News

The following selections are now available in JSC's Technical Library, Bldg. 45, Rm. 100.

A Professional's Guide to Business Image and Etiquette. Sourcecom, c1989. HF5389.P76 1989.

Hiring and Firing. Padgett-Thompson, 1988. HF5549.5.R44 H57 1988.

Interviewing People Seminar. GH Publications, Padgett-Thompson, c1987. HF5549.5.I6 I57 1987.

JSC

Swap Shop

Property

Sale: Egret Bay condo, 2-2-CP, all appl, FPL, blinds, fan, patio, storage, pools, boat ramp, \$42.9K. x30092 or 481-3637.

Lease: SW Houston, 4-2.5-2, formal LR/DR, pool, no pets, \$950/mo. Ruth, 333-7940 or 933-8917.

Sale: Lake Placid on Guadalupe, 3-2-2 rock cottage on 90 ft waterfront lot, assum VA loan, \$93K. 488-7387.

Sale: Westwood Shores lot on Lake Livingston, was \$9.5K now \$6.5K. x31834 or x30032.

Rent: Arkansas cabin, Blue Mountain Lake, A/C, fully equip, sleeps 6, \$250/wk or \$50/day. x33005.

Lease: Pipers Meadow, 3-2-2A, lg den, deck, FPL, formal DR, \$895/mo plus dep; CLC cond, 2-1, FPL, all appl, mini blinds, pools, storage, W/D conn, \$475/mo. x31275 or 486-0315.

Sale: Middle Brook, 3-2-2, brick, pool, aesthetic backyard, atrium, FPL, MBR has computer, workout rm, ex cond, \$99.9K. 286-3806.

Lease: Webster/Ellington, 2-1-condo, W/D, avail 8-15, \$460/mo. Dave, x38156 or Herb, x38161.

Sale/Lease: Bay Glen, 3-2.5, 2 story, big yard, cul-de-sac, Richard, (409) 925-4463.

Rent: Med Center, 2 story condo, 2-1.5-CP, W/D, FPL, cable, lg kitchen w/breakfast, walk-in closets, \$675/mo. Charlie, 333-7804 or 799-9101.

Sale: Bay Glen, 3-2.5-2, 2 story, formal LR/DR, family rm, double glass storm windows, \$119K. HO, x32941 or 486-5861.

Sale: Two water view lots near NASA, \$38.5K ea; Bayfront lot on Todville, can finance, \$110K. Don, x38039.

Sale: Sageglen, 3-2.5-2, 2 story, FHA assum, no approval, wet bar, FPL, lg rms, \$632/mo + equity, or \$75.5K. 484-5027.

Sale: Patio home, newly landscaped, new roof, 2-2, FPL, 2 car detached garage, priced to sell. 480-3089.

Sale/Lease: Dickinson, 3-2-2, lg LR/master BR, fenced yard, assum, available Aug. 538-1217.

Rent: Tranquility Lake, 1 BR, W/D, FPL, micro, fans, \$450. Vic, x30189 or 333-2482.

Lease: Townhouse 2-2.5-2CP, over 1500 sq ft, new carpet, tile, lg closets, no pets. x30981 or 481-1239.

Sale/Lease: The Landing 2-2 waterfront condo, pools, marina, exercise rm, sauna, pavilion, tennis, \$640 plus \$150 annualized utilities or \$69.9K. 280-5801 or 326-2221.

Cars & Trucks

'89 Jeep Wrangler Islander, red w/gray soft bikini top, 6 cyl, 5 spd, A/C, AM/FM/cass, 45K mi, \$10,950. Rob, x30762 or 992-4507.

'84 Nissan 300ZX 2+2, auto, A/C, gray, stereo, \$4950; or '80 Pontiac Phoenix V6, auto, A/C, stereo, lifetime battery, \$1650, sell one not both. x30092 or 481-3637.

'78 Olds Omega, 86K mi, P/S, A/C, good cond, \$550 OBO. Amin, x31633 or 486-9766.

'85 Chry Laser, 5 spd, turbo engine, A/C, elec mirrors, tilt, cruise, AM/FM/cass, ex cond, \$2.6K. 333-6795 or 925-3210.

'76 Datsun PU, A/C, auto, good body, does not run, \$400 OBO. 481-0780.

'87 Mercury Sable GS, ex cond, loaded, 55K mi, \$6.5K. 337-3406.

'87 Toyota Supra, blk, low mi, auto, trans, \$10,250. Tom, x31418 or 781-7798.

'83 280ZX Nissan, auto, T-tops w/locks, A/C, AM/FM/cass, extra spare tire, nose bars, ex cond, \$3.2K OBO. 334-2335.

'76 Datsun B210, 4 spd, yellow, new trans, new engine, \$950. 334-2335.

'84 BMW 318i, silver w/tan int, all records, ex cond, \$6.2K. 280-2735.

'79 VW Pop-Top camper, rebuilt engine and brakes, \$3.9K. David, 929-7120 or 332-9044.

'86 Alfa Romeo Spyder Quad, red/grey leather, 53K mi, \$7.6K. x30636 or 438-7162.

'82 Mazda RX7, blk, 5 spd, 98K mi, new tires, brakes, shocks, \$2K. x30962.

'72 240Z Datsun, comp restored, all orig, \$2.8K. 280-5818 or 426-7305.

'84 Camaro Z-28, dk blue, ex cond, recent paint, tires, 69K mi, \$4995. 480-8548.

'89 Honda Civic LX, 4 dr, P/W, P/D, P/B, P/S, AM/FM/cass, A/C, new tires, ex cond, \$8K. Jay, x35814 or 992-3149.

'75 Lincoln, P/W, P/S, P/B, good cond, \$975. 486-0126.

'89 Ford Probe GT Turbo, ex cond, \$10,750 OBO. Dan, 280-2780 or 457-2850.

'82 Pontiac J200, 3 dr, auto, fuel inj, 85K mi, good cond, \$1050. Ton, x33242 or 996-5068.

'84 Subaru, wht, 3 dr, hatchback, A/C, tinted windows, louvers, AM/FM/cass, 58K mi, ex cond, \$1350. 286-8431.

'84 Olds Ciera, lots new, ex cond, 4 dr, 4 cyl, lt blue, A/C, auto, \$2.2K. 280-2192 or 480-6697.

Cycles

'79 Honda CM400T, 9.4K mi, sitting for 3 yrs, \$300. Ron, x31959 or 482-5952.

Man's Raleigh Pursuit, 12 spd, quick release front wheel, ex cond, \$225. Marie, x30898 or 488-5614.

'89 Kawasaki Ninja ZX600, blk, \$2950. Max Kilbourn, x38127 or 482-7879.

Boats & Planes

'77 J-24 racing sailboat, totally restored, new hardware, rigging, rudder, keel faired to min, trlr coated w/zinc and paint, 4hp Evinrude, \$11.5K. David, 929-7120 or 332-9044.

'88 Searay Seville, 18 ft, AM/FM, green/wht, 130hp, IB/OB Mercruiser, rear view mirror, speedometer, boarding ladder, boat cover, Murray trlr, was \$7890, now \$6490. Max Kilbourn, x38127 or 482-7879.

9 ft kayak w/paddle and life jacket, \$450 OBO. Jeff, 667-8100 or 486-3991.

Kerma Osprey windsurfer, 11 ft, ASA, 185 liters, multicolor full batten 4.7 sail plus 4.0 learner storm sail, \$450; sailboat stanchion racks, \$30. Lili, x30962.

15.5 ft, runabout w/trlr, 8hp Merc, and all

JSC

Dates & Data

Today

Cafeteria menu—Special: barbecue link. Entrees: deviled crabs, broiled codfish, liver and onions. Soup: seafood gumbo. Vegetables: buttered corn, green beans, new potatoes.

Monday

Cafeteria menu—Special: chili and macaroni. Entrees: barbecue sliced beef, Parmesan steak, spare rib with kraut. Soup: French onion. Vegetables: ranch beans, English peas, mustard greens.

Tuesday

Cafeteria menu—Special: corned beef hash. Entrees: meatballs and spaghetti, liver and onions, baked ham with sauce. Soup: split pea. Vegetables: buttered cabbage, cream style corn, whipped potatoes.

Wednesday

Cafeteria menu—Special: barbecue link. Entrees: cheese enchiladas, roast pork and dressing. Soup: seafood gumbo. Vegetables: Pinto beans, Spanish rice, turnip greens.

Thursday

Cafeteria menu—Special: chicken fried steak. Entrees: roast beef with dressing, fried perch, chopped sirloin. Soup: beef and barley. Vegetables: whipped potatoes, peas and carrots, buttered squash.

Aug. 2

Cafeteria menu—Special: fried chicken. Entrees: fried shrimp, baked fish, beef stroganoff. Soup: seafood gumbo. Vegetables: okra and tomatoes, buttered broccoli, carrots in cream sauce.

Aug. 6

Space station symposium—NASA Headquarters' Office of Space Station will host a conference on

"Space Station Evolution: Beyond the Baseline," beginning at 8 a.m. Aug. 6-8 at the South Shore Harbour Resort and Conference Center. Vice President Dan Quayle has been invited to give the keynote address. Other speakers will include William Lenoir, associate administrator for space flight; Richard Kohrs, director of Space Station Freedom; and the heads of the European, Japanese and Canadian space station programs. For more information or registration, contact Carla Armstrong, x39071.

Aug. 8

NPMA dinner—The JSC National Property Management Association will meet at 5 p.m. Aug. 8, at the Gilruth Center. The guest speaker will be Gloria Delgado, area manager for internal affairs with Southwestern Bell. For more information, contact Sandra Pierce 282-4151.

Aug. 19

Contract pricing seminar—The National Contract Management Association and the University of Houston-Clear Lake are cosponsoring a seminar on "Estimating Cost and Pricing of Government Contracts" at 7:45 a.m. Aug. 19-21, at the University of Houston-Clear Lake, Bayou Bldg., Rm. 2-532. Cost is \$150 per person, which includes course materials. For registration, call 283-3120 or 283-3122. For more information contact Jean Stell, 283-3120.

Aug. 22

SCS meeting—The Society for Computer Simulation will meet at 11:45 a.m. Aug. 22 at the Lockheed Plaza 3 Bldg., first floor PIC Rm. JSC's Liz Bains will speak on the "Simulation System Branch." No reservations required. Lunch will be available. For more information, con-

tact Wade Webster, 244-4306, or Robin Kirkham, 333-7345.

Aug. 28

BANN meeting—The Bay Area NAFE (National Association of Female Executives) Network will meet at 11:30 a.m. Aug. 28 at the South Shore Harbour Country Club. Blanca Gutierrez, owner of Comedy Showcase, will discuss owning and operating a business. Call Sharon Westerman, 486-8972, for more information.

Oct. 17

Alumni League meets—The NASA Alumni League's JSC chapter will meet October 17-19, for the NACA Reunion in Galveston's San Luis Hotel. For more information contact Guy Thibodaux 333-5340.

Oct. 27

JSC Bike Club—The Lions Eye Bank of Texas and the JSC Bicycle Club are hosting the 13th Annual Texas Coastal Century bike ride at 8 a.m. Oct. 27 at the University of Houston-Clear Lake. Registration is \$15 before Oct. 1 and \$20 late/on-site registration fee. Distances will be 25 miles, 34 miles, 62 miles, and 100 miles. All proceeds will benefit the Lions Eye Bank of Texas and its Sight Restoration Programs. For more information contact Tom Moore, 798-5509, or Mike Prendergast, 480-3330.

Nov. 6-7

Conference and Symposium—The Eighth Annual NASA/Contractors Conference and National Symposium on Quality and Productivity will convene on Nov. 6-7 at the George R. Brown Convention Center. The event will address the current strategies in Total Quality Management. Code QB (FTS 453-8415) will act as a point of contact and handle the invitations.

ski needs, \$1.9K. Taiga, x45385 or 286-7859.

25 ft McGregor sailboat, AM/FM/cass, marine VHF, depth, head, 6hp mariner, custom rigging, trlr, \$6950. Kevin Walters, 486-6411 or 532-2181.

16 ft Jon boat, 7hp motor, no trlr, \$200 OBO. 339-1337.

'79 30' Cape Dory, 15hp Volvo, 5 sails, A/CH, bimini, wheel, head, galley, shower, VHF, depth, knot, \$35.5K. 474-5414.

PC XT Turbo, 640K RAM, super EGA 800x 600, 2 FD, 2 HD, 20 MB ea, modem and math coprocessor, \$500 OBO. Terry, x36351 or 996-9164.

Lloyds record player, two speakers, AM/FM radio, \$50. 946-7587.

IBMjr computer, 128K, color monitor, printer, ex cond, \$520. Ton x33242 or 996-5068.

Samsung monitor + Hercules compatible card, amber monochrome, w/tilt/swivel base, \$75. 474-2654.

IBM portable PC w/Epson printer, 640K, 2 FD, \$400 OBO. Molly, 282-4248.

Yamaha studio piano, blk lacq finish, \$3.2K. 488-6232 or 929-7283.

Rogers 5 piece drum set w/hardware and cases, wht pearl, good cond, \$575 OBO; Synsonics electronic drums w/case, \$45 OBO. x38871.

Tascam 8 track recorder, 4 DBX 150's, Tascam M30 mixer, \$3,250; Fender bullet bass/case, new cond, \$300; Hammond M3 organ, good cond, \$595. 474-3612.

Golden Retriever. x35896 or 488-7982.

Sale, rabbits, show quality. Gallo, 554-6200.

Shar-Pei (wrinkle dog), blk, 2 yrs, \$450. 334-2335.

Long hair shepard/collie mix, female, spayed, free. 326-5155.

Baby cockatiels. Linda, 484-7834.

Rare Akita pup, AKC, male, fawn/wht, ex guard dog. \$300. 326-3811.

BR suite, 3 drwr dresser, mirror, 2 night stands, 1 chest-of-draws, ex cond, \$350; 1 LR set, gold and maroon love seat, chair, sofa, \$150. 282-4465 or 332-3323.

Matching sofa, love seat, and chair, \$200. Amin, x31633 or 486-9766.

8 person hot tub, hard top cover, skirt, test

kits, ex cond, \$1.6K. x38311 or 992-5832.

Maytag gas dryer, wht, \$125. Becky, x36530 or Marry Ann 941-6156.

Bassett king sz four-poster pine bed, 4 yrs, boxsprings, mattress, comfoter, all, \$400 OBO. Vanessa or J. C. 282-4563 or 943-8443.

American of Martinsville lg wooden com-

mode table, shelf, 2 drwrs, \$40; American of Martinsville 6 ft coffee table w/cane shelf, \$40; Thomasville, 4 high back DR chairs, \$75; Singer touch and sew sewing machine w/cabinet, ex cond, \$275; New Home antique sewing machine, \$200. 480-4101 x202.

Sofa and love seat, light brn w/wood trim, love seat, has 2 recliners built-in, ex cond, \$125 ea or \$200 both. x39295 or 484-6033.

Solid cherry DR chairs, \$750; several solid oak DR tables, some w/chairs, \$300 to \$600; king and queen post beds, no matt or box-springs, \$200 ea. 282-4675 or 480-1356.

Refrigerator, icemaker, int water dispenser, harvest gold, \$200; Panasonic full sz microwave, \$125. x38875.

Rattan dinette set, 4 chairs, round extends to oval w/leaf, ex cond, \$175. 282-2805.

Contemporary sofa w/matching chair, beige, brn, wht, \$175. Terry, 283-6646 or 554-6631.

Early American dbl dresser, hutch and night stand, \$250; wood and brass daybed w/trundle, \$250. David, x38947.

Photographic

Sale: Cannon AE-1 SLR 35mm, w/flash attachment, 28mm and 50mm lenses, BO. Gail, 283-5366 or 333-4051.

Hanimax 35mm underwater camera, motor drive, flash, close up, lens, \$200. Kevin Walters, 486-6411 or 532-2181.

Want lg box fan. Barbara, 554-6200.

Want to rent/lease 3-4 BR home in Alvin. 335-6415 or (409) 849-3791.

Want good dual cassette system w/4 speakers; two wing back chairs. 326-5155.

Want roommates to share lg house in Memorial area, non-smokers, pets welcome. Mike, 283-5890 or 868-5132.

Want night time babysitter (4 pm to 1:30 am, wk nights), free room and board, 2 story home, second floor is yours. Kay, 337-3122.

Want full face motorcycle helmet, sz 7.5. 282-3215 or 480-9448.

Want roommate to share 2 BR furn apt, non smoker, must like cats, avail Sept 1, \$400/mo, all bills paid except long distance calls. Susan, 283-5704.

Miscellaneous

Lg playpen, \$60; lg book shelf, \$150; book stand adj shelves, \$50. 480-1264.

Doughboy above ground pool, 16' x 24' x 4' oval, 4 yrs old, diatomaceous earth filter, 1 yr old, \$700. Karen, x49664.

Pottery equipment, pottery wheels (2), kiln furniture, was \$900, now \$400. (409) 849-3791.

Calculator, microscope, TV, Turbo GrafX 16,

sewing machine, ping/pong table, Gameboy,

fish tank, answering machine, children's video

smarts, antique console, motorcyclist 1 piece

raincoat, 3 piece silver tea set, w/tray, BO. x35896 or 488-7982.

American Racing blk wire mesh rims (4),

ex cond, \$250. Rick, 283-1988 or 996-8961.

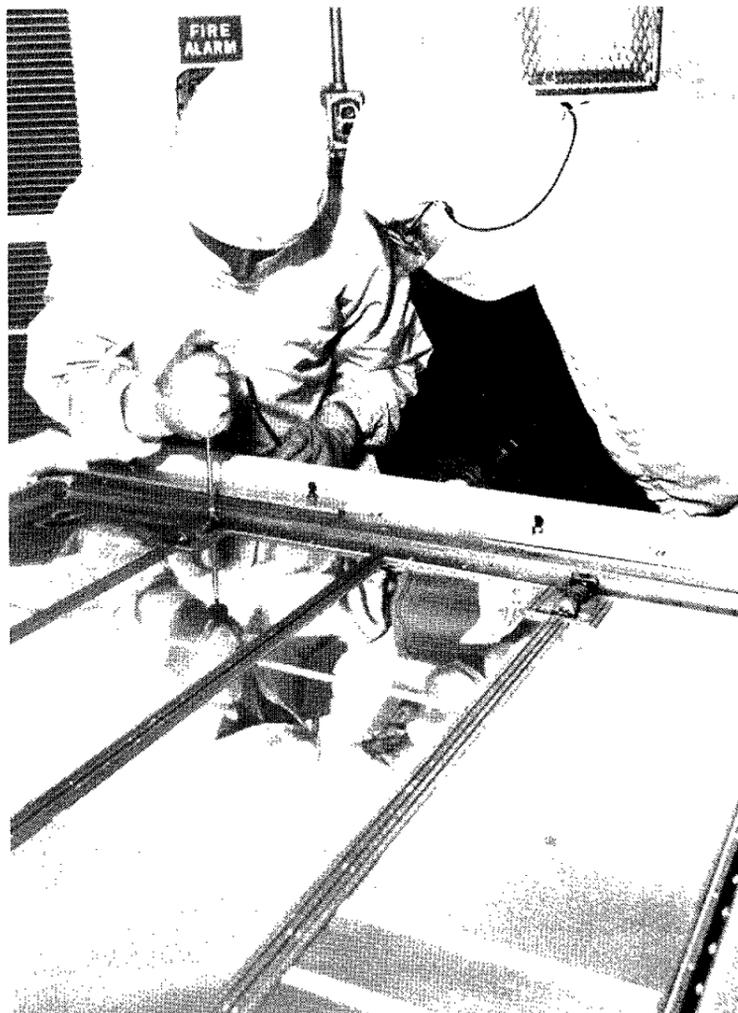
.22 cal pistol, western style 9 shot revolver,

good cond, \$150. Alan, x38854 or 486-4243.

Stairstepper, ex cond, was \$300, now \$150;

Suspicious Confirmed

Space environment matches predictions in early data from Long Duration Exposure Facility



Top: Dr. Fred Horz of JSC's Solar System Exploration Division, right, and Dale Atkinson of POD Associates, inspect and remove gold meteoroid capture cells from Horz's LDEF experiment at Kennedy Space Center.

Bottom left: An impact crater shows the damage that hypervelocity impact made on an LDEF silicon solar cell. The magnified crater is about 2 millimeters across. Bottom center: JSC scientists examine all debris and micrometeoroid impacts on LDEF before experiment trays are removed. Pictured are Mike Zolensky, head of the LDEF Meteoroid and Debris Special Investigation Group, Lockheed's Martha Allbrooks. Bottom Right: Another hypervelocity impact crater, this one in a Teflon thermal blanket.

NASA Photos

NASA's Long Duration Exposure Facility is yielding a rich harvest of data on the conditions in Earth orbit and how spacecraft materials and systems performed there.

JSC scientists who have been instrumental in the data analysis say the record of wear and tear on the bus-sized satellite has revealed a few surprises, but for the most part is confirming prelaunch predictions about the environment.

LDEF, built by Langley Research Center, deployed during STS-41C in April 1984 and retrieved during STS-32 in January 1990, gathered information on space radiation, atomic oxygen, meteoroids, contamination, space debris, space systems and life sciences. It was NASA's first opportunity to expose a spacecraft, with an intentionally selected set of materials samples, to the harsh environment of space for a long period and retrieve the spacecraft and samples for extensive analysis.

Among the findings so far:

- A meteoroid experiment recorded the direction and precise time of more than 15,000 impacts. Analysis will provide clues to the origin and evolution of both natural meteoroids and man-made debris.

- LDEF confirmed the existence of beta meteoroids — minute dust grains leaving the solar system under solar radiation pressure. Its experiments also identified debris particles from space shuttle missions and other launch vehicles.

- Several investigators reported man-made debris impacts on LDEF's trailing edge. Researchers believe the impacts show for the first time that debris particles exist in elliptical orbits.

- The performance of protective paints varied dramatically. White polyurethane paint was darkened by ultraviolet radiation, but atomic oxygen continually swept away the darkened paint on LDEF's leading edge. The latter effect caused these surfaces to look freshly painted.

- Many polymers on the leading surfaces were eroded. Some Kapton thermal blankets completely eroded away from their experiments. Silvered Teflon thermal blankets suffered erosion, a decrease in mechanical properties and darkening and delamination

around impact sites.

- LDEF gathered a large body of data about induced radioactivity in aluminum, stainless steel, titanium, lead, copper and nickel. Researchers found radioactive beryllium-7 on LDEF's leading surfaces — the first known evidence for radioactive isotope accumulation onto an orbiting spacecraft.

- Three cosmic ray experiments showed good sensitivity and resolution. The measurements are six times more sensitive than before.

- Most living specimens remained alive after exposure to varying degrees of radiation during their journey in space. Shrimp had shortened life spans and some genetic mutations. Plants grown from space-exposed seeds had variegated, or spotted, leaves and flower buds. Some leaf parts were a normal green, others totally lacked chlorophyll.

- Few electrical or mechanical system failures were caused by the space environment. Some low-cost electrical components were used successfully, but relays were a continuing problem. The tape recorders functioned well, and data tapes had no loss of stored information.

LDEF carried 57 different science and technology experiments. Investigators continue to study the results and draw conclusions that will contribute to the knowledge base for long-lasting space endeavors such as Space Station *Freedom*, the Earth Observing System and exploration of the Moon and Mars.

Of great concern to the JSC scientists studying LDEF are the characteristics of the man-made orbital debris and natural micrometeoroid environment.

JSC's Mike Zolensky, chairman of the Meteoroid and Debris Special Investigation Group, said the absolute number of particles that hit LDEF was very close to preflight models, but that the trajectories of the particles were significantly different.

"We assumed there would be a smooth increase from leading edge to trailing edge," he said. "It turns out it isn't a smooth curve at all. That probably implies that the environment is evolving. It means protecting vehicles is a little trickier; you can't put all your shields in front."

Don Kessler, JSC's chief scientist for

orbital debris research, said the discovery is both good and bad. "It means that for things like space station there will be more debris hitting the rear surface. The positive side is space station is already protecting against meteoroids on the rear surface and they're covered."

Also on the good side, he said, is that trailing edge impacts mean some debris must be traveling in elliptical orbits. Models created before LDEF assumed there must be a very large debris population at high altitudes to feed the debris population at lower altitudes. But the detection of debris in elliptical orbits means the amount of debris in high orbits may be less than anticipated.

"At space station altitudes the estimates we've been making are still good," Kessler said. "At higher altitudes and at lower altitudes they can be refined."

Fred Horz, who worked with several other JSC and outside scientists to develop "The Chemistry of Micrometeoroids" experiment that flew on LDEF, has been counting, measuring and analyzing the chemical makeup of debris craters on his gold and aluminum collectors. He, too, believes the directionality of orbiting debris is an important discovery.

One LDEF instrument recorded each debris or micrometeoroid as it hit, and there were time periods when collisions were much more frequent. This implies elliptical clouds of man-made material particles that strike orbiting spacecraft like "debris storms."

Horz said the sizes of particles that hit LDEF were consistent with existing models, and that the data is encouraging as it relates to future long-duration space facilities. The largest particles were natural micrometeoroids about the size of a small grain of sand.

"The fact is, LDEF was up there six years — 130 square meters — and not one single one-eighth-inch thick piece of aluminum was penetrated," he said.

Detailed analysis of the particle residue in craters is continuing, he said.

"One very important finding from LDEF is how incredibly stable it remained during its 5.9 years in space," said Sally Little, liaison between the LDEF Science Office and the Space Station *Freedom* office at NASA Headquarters. "*Freedom* will be designed to remain stable as well, although its altitude will

differ. LDEF brings home how important it is to protect the leading surfaces.

"We are using that information to help us determine how much shielding we need against the debris environment," Little noted. "We are confident now, however, that we don't need as much meteoroid and debris shielding on the trailing side of *Freedom*. We can save weight, reduce the maintenance requirements and ultimately save money — a direct result of the LDEF experience."

"At this point, LDEF shows there is a definite threat out there to consider when you decide what you should and shouldn't use to build space station in the first place," said Tom See, a Lockheed specialist in impact cratering working with Zolensky and Horz.

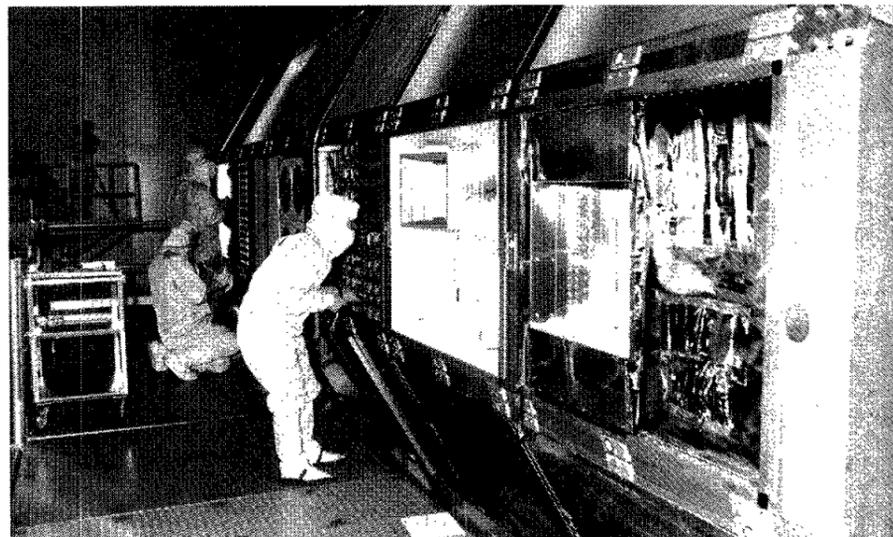
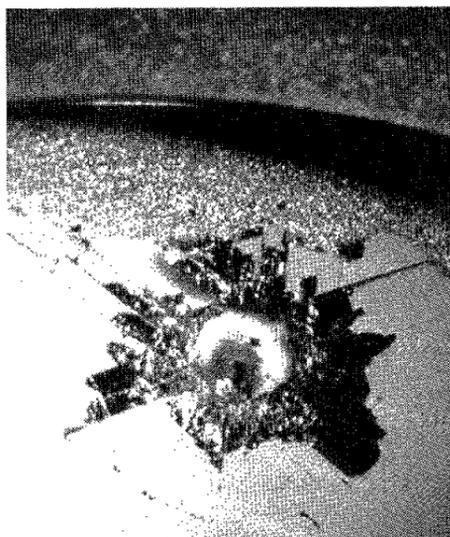
JSC scientists and engineers also are interested in the effects of atomic oxygen on spacecraft components, and Lubert Leger, chief of Engineering's Materials Branch, said LDEF data confirms the database from short-duration experiments on shuttle missions. The reaction rate for Teflon-like materials is slightly higher than on previous experiments, but that is believed to be caused by the combined effects of atomic oxygen and ultraviolet light that has been demonstrated in laboratory experiments.

The atomic oxygen data is telling materials experts that for Space Station *Freedom*, organic coatings such as polymers and paints should be avoided when possible in favor of metal surfaces.

"I think the bottom line is that LDEF is confirming our planned materials selection process and giving us confirmation to proceed with the design of space station," Leger said.

LDEF's impact won't be limited to hardware. The life science experiment that received the most attention was SEEDS (Space Exposed Experiment Developed for Students), which distributed 12.5 million tomato seeds to 3.5 million students.

"Reports show that space-flown seeds had slightly higher germination rates than unflown seeds," said William Kinard, Head, LDEF Science Office. "This may indicate that space can be used to store seed material in the future. But the stimulus that this experiment has provided to student interest in science, may prove to be its most important contribution." □



Global change study raises new questions

A NASA study released last week indicates that the Sahara Desert, the world's largest, has undergone a variety of fluctuations in size during the past 11 years.

Since 1980, scientists at Goddard Space Flight Center have studied data from a variety of Earth observing satellites in an effort to provide insight on global climatic change. One study focused on the size of the Sahara Desert in Africa using meteorological satellite data.

"The object of this study was to look at the size of the Sahara Desert to see if it is increasing in size," according to Dr. Compton J. Tucker, Goddard Earth scientist. Scientists

believe that changes in global desert area would mean that the Earth is undergoing a climate change on a global scale.

"Our data indicate the Sahara has expanded at times and contracted at other times since 1980," he said. "We can't say for sure, based on this data, whether or not the climate is changing. However, data such as these will provide a baseline to compare future data against to hopefully answer this question."

The data indicate that the southern boundary of the desert had expanded to the south about 80 miles from 1980 to 1990, but that there were rather dramatic move-

ments both northward and southward. The northern boundary includes the Atlas Mountains and the Mediterranean Sea, and, therefore, is not subject to large shifts. After a big movement toward the south from 1981 to 1984, the Sahara retreated northward about 88 miles during 1985 and 1986, then, migrated 34 miles back south in 1987. The southern boundary then retreated northward 62 miles in 1988 before expanding to the south 46 miles in 1989 and 1990 where it lies today.

"The fluctuations are determined by the amount and distribution of the rainfall in the area," Tucker said.

"That controls the amount of vegetation we see from space." Those data were obtained from four National Oceanic and Atmospheric Administration satellites, NOAA-6, 7, 9 and 10, launched by NASA. The satellite data are derived by measuring the red and infrared light energy reflected back into space from the Earth's surface. "It is impossible to study large-scale climatic phenomena without Earth-orbiting satellites," Tucker said.

Dr. Tucker collaborated with Wilber Newcomb, of Goddard, and Harold Dregne, of Texas Tech University, Lubbock, Texas, on the Sahara study.



NASA Photo
A new NASA study shows the Sahara Desert is growing and shrinking from year to year.

Office Services offers series of Xerox classes

The Office Services Section in JSC's Management Services Division has scheduled a series of classes on how to use Xerox 6085 work station applications.

The classes will be offered from 8-11 a.m. and 1-4 p.m. in Room 104 of the Hernandez Engineering facility at 17625 El Camino Real. Anyone interested in participating should submit a JSC Form 596 to the training coordinator at JM32. For more information, call Doris Grosshauser at x34005.

The schedule includes:

Free-hand Drawing, July 29-Aug. 2; Tables, Aug. 5-9; Fields/Fill-in Rules, Aug. 12-16; List Manager, Aug. 19-23; Define/Expand, User Profile and Mail Merge, Aug. 26-30; Spreadsheets, Sept. 3-6; Tips and Techniques, Sept. 9-13; and Use of the Electronic Printing System, as needed.

Badging office work coincides with roadwork

(Continued from Page 1)

front entrance of the center. The new badging office will be built across Second Street from Rocket Park. In the future, a small group of buildings may be constructed just outside the gate to help serve visitors who do not need full center access.

Moving the badging facility is timed to coincide with the fall 1992 completion of work to reconfigure JSC's main entrance. That road construction, scheduled to begin in early 1992, will separate traffic to the new visitor center, Space Center Houston, from employee traffic. The new configuration will open a public thoroughway from Bay Area Boulevard to NASA Road 1 at the Nassau Bay City Hall, and eliminate the need for a security gate near the JSC Credit Union.

Meanwhile, construction is winding down on several new facilities that broke ground last year.

Bldg. 9 East has been completed and turned over to the Robotics Division. McCright said the facility is being occupied.

The refurbished Bldg. 5 and addition were turned over to the government two weeks ago and the new Space Station Control Center addition to Bldg. 30 is running ahead of schedule with a completion date set for November of this year.



JSC workers Keith Fletcher and Malise Mills are married at Rocket Park on Saturday. To the groom's right is best man Roger Simpson. To the bride's right is maid of honor Linda Slifer.

'With this rocket, I thee wed'

Marriage, the final frontier. This is the voyage of Keith Fletcher and Malise Mills, who exchanged vows Saturday where no one had exchanged vows before.

The ceremony was standard, performed by a justice of the peace. There was a bride, a groom, a best man and a maid of honor. But that's where "normal" stopped, and the married lives of two Mission Operations Directorate workers began.

The site was Rocket Park, in front of the Little Joe rocket. The music was from "2001: A Space Odyssey," "Star Wars" and "Superman."

The bride was Malise Mills, a NASA

employee in the Flight Analysis Branch who will be providing back room support for the Guidance Officer on STS-43. The groom was Keith Fletcher, a Rockwell Space Operations Co. employee in the Trajectory Operations Branch who will be a Trajectory Officer on STS-43.

The maid of honor was Linda Slifer and the best man Roger Simpson, two more Trajectory Operations workers.

"We didn't really want an elaborate ceremony and since we both work on site it seemed like the right thing to do," Fletcher said. "We are both kind of caught up in our work. We just thought it would be a neat place to have a wedding."

Brooks calls for additional defense funding for space

(Continued from Page 1)

the ball is now in NASA's court," he said. "How we execute our projects over these next three to five years is going to determine to a large measure the pace at which this country is eventually going to go to Mars.

"Visions, perhaps, are the easy part," he said. "It's executing the task at hand that sometimes gets a little tougher."

Thompson said that even considering the space shuttle's impressive statistics to date, it still needs to be used to its full potential.

"The actions I would propose

tonight in Spaceweek '91 are ones that I believe would really excite the manned part of our space program as we close out this decade. It can be done within any budget that I've heard discussed on the Hill. That is to exploit the space shuttle.

"I believe within 30 months, sometime by late 1993, we could fly a Spacelab mission lasting not a few days, a week, but perhaps a few months," he said. "I believe we have the capability now or can soon get it to demonstrate an unpowered automatic landing, and we should do this six months to a year prior to relying

on it after a long-duration flight."

Thompson said his plan would accelerate by 18 to 24 months the beginning of space station research.

Brooks urged the same kind of innovation in the budget process.

"The time is upon us to give some serious consideration to changing our notions about the way we fund the exploration of space," Brooks said. "It's time to clearly recognize the role that the United States Defense Department should and must play in developing our space program."

Cohen said that in the coming

No STS-43 landing passes

Because of the recent change in Kennedy Space Center's status to one of two primary shuttle landing sites, there will be no car passes for the STS-43 landing at either Dryden Flight Research Center or KSC.

Dryden will not issue employee landing passes unless that site is prime for a particular mission, and current access is too limited to accommodate private cars at the KSC Shuttle Landing Facility viewing area.

Car passes will be available for scheduled California landings, such as the STS-44 mission in November, by sending a written request to Linda Copley, Mail Code AP4. Car passes to view all launches continue to be available by writing to AP4.

Employees who are in the Los Angeles area may view unscheduled California landings at Edwards Air Force Base's East Shore Viewing Area without car passes. To get to the East Shore Viewing Area go north from the Los Angeles area on Highway 14, exit right on Avenue F, turn left at Sierra Highway, turn right at Avenue E, turn left at 140th Street, turn right on Avenue B, then curve onto Mercury Blvd. and into viewing site.

year, NASA and JSC must become more efficient, reducing program costs and creating a unified program of unmanned, scientific and human exploration, and it must be prepared to take on those challenges.

"When you hear of another great debate going on in Washington as Mr. Brooks has participated in over the future of space exploration," Cohen said, "step outside and look up into the heavens and remember. Remember where we've been, what we've done, and what we've learned and what lies ahead for all of us and our children in the future."

Total Quality videotapes being distributed

(Continued from Page 1)

process is patterned after the one used to select winners of NASA's George M. Low Trophy, which recognizes outstanding contractor quality and productivity efforts.

Under NASA Administrator Richard Truly's instructions, all centers are working to develop programs that will improve their performance through the application of Total Quality principles, processes and techniques at all levels.

JSC's directors and program managers are organized as the

center's Senior Quality Board, and a Total Quality Steering Committee has been established with deputy directors as representatives from all organizations. These groups are in the process of involving employees at all levels in the shift to a Total Quality philosophy.

One way that involvement is being encouraged is through Q-Plus teams, similar to the steering committee but smaller in scope. So far, the Administration, Engineering, Mission Operations and Safety, Reliability and Quality

Assurance Directorates have established their Q-Plus teams which will identify areas targeted for quality improvements and facilitate the efforts intended to involve all employees in each organization.

A videotape and a companion pamphlet called "Total Quality and JSC: Walking the Path of Continuous Improvement," were produced recently and are being distributed to division-level managers, who will use them to help familiarize employees with the Total Quality program.

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Correction

In the July 19 issue of the Space News Roundup, an article about interns who are working in the Space and Life Sciences Directorate incorrectly stated that the internship lasts three weeks.

The summer internship, granted to three Houston-area high school students each year who participate in the Science Engineering Fair of Houston, lasts eight weeks. The program's goal is to spark interest in science careers.